

# Plant Hormones in Plant Propagation

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# **Plant Hormones = Phytohormones**

- ⇒ **Organically produced.**
- ⇒ **Synthesized and Translocated to site of action**
- ⇒ **Active in small concentrations ( $\mu\text{mol}$ , ppm)**
- ⇒ **Signal transduction — a molecule that acts as a signal to regulate plant growth & development**

**Hormone (i.e. auxin)**



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graph TD; A[Hormone (i.e. auxin)] --> B[Hormone Receptor]; B --> C[Signal Transduction]; C --> D[Gene Expression]; D --> E[Plant Growth & Development Response (i.e. rooting)];
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A vertical flowchart on a blue background with diagonal stripes. It consists of five rectangular boxes connected by downward-pointing white arrows. The first box is 'Hormone (i.e. auxin)', the second is 'Hormone Receptor', the third is 'Signal Transduction', the fourth is 'Gene Expression', and the fifth is 'Plant Growth & Development Response (i.e. rooting)'. The first four boxes have orange borders, while the last box has a red border.

**Hormone Receptor**

**Signal Transduction**

**Gene Expression**

**Plant Growth & Development Response  
(i.e. rooting)**

# **Plant Growth Regulators**

⇒ **Synthetically produced**

⇒ **Organically produced (phytohormones)**

# Five Classes of Plant Growth Regulators

1. Auxins
2. Cytokinins
3. Gibberellins (GA)
4. Ethylene
5. Abscissic Acid (ABA)

⇒ Ancillary Compounds

⇒ New Potential Phytohormones

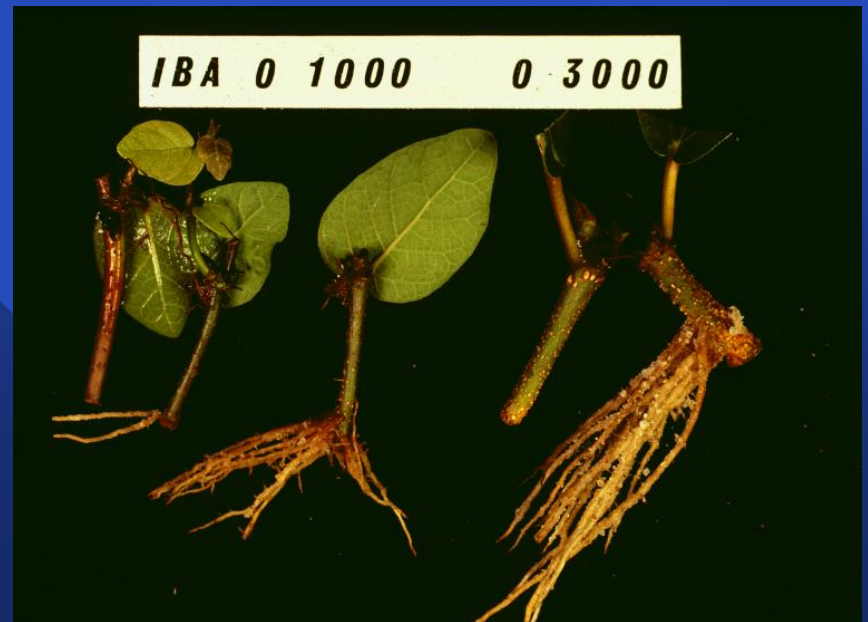
# Auxins

⇒ Compounds: 2,4-D, NAA, IBA, IAA,

⇒ Enhance Adventitious Root Formation

⇒ Most cuttings  
1000-3000 ppm;

⇒ Maximum 10,000 ppm

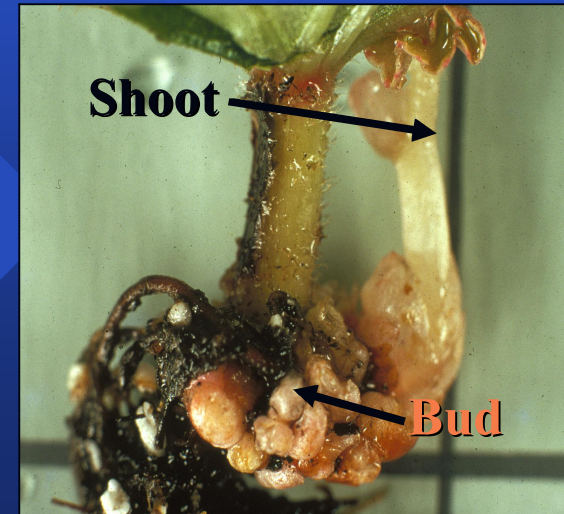
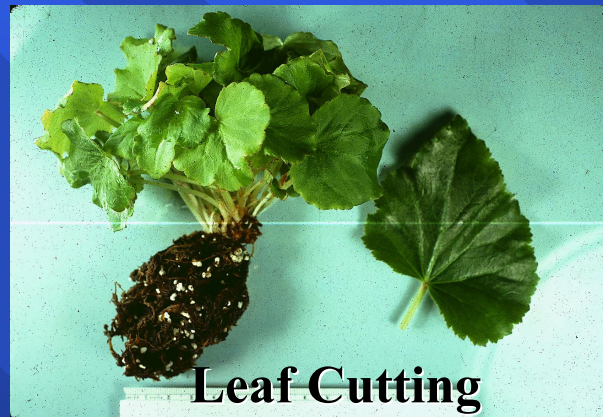


# Cytokinins

- ⇒ **Compounds:** TDZ (thidiazuron), PBA, BA, Kinetin, Zeatin, 2iP
- ⇒ **Enhance Adventitious Bud and Shoot Formation in leaf and root cuttings**
- ⇒ **Used in tissue culture systems in Stage II - Shoot Proliferation**
- ⇒ **High Cytokinin : Low Auxin ratio** stimulates adventitious bud formation & overcomes apical dominance



# Cytokinins & Leaf Cuttings





# Cytokinins & Leaf Cuttings (con.)



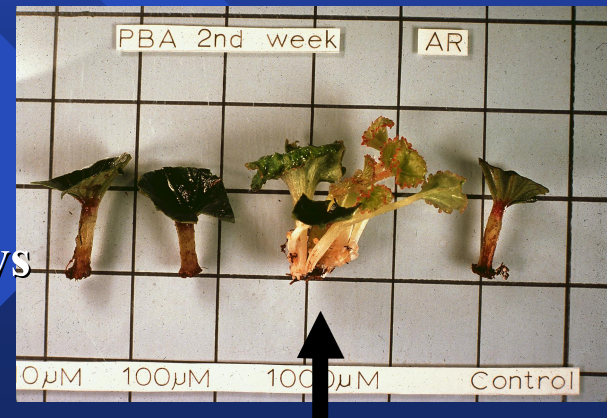
High Conc



7 days



14 days



# Gibberellins

- ⇒  $GA_3$ ,  $GA_{4/7}$ , + 90-plus GA compounds
- ⇒ Foolish seedling disease with rice seedlings
- ⇒ Generally inhibit bud, shoot and root formation, so not used in vegetative propagation
- ⇒ Sometimes used in tissue culture systems
- ⇒ Important in breaking seed dormancy



# Ethylene

⇒ Gas      $\text{H}_2\text{C}=\text{H}_2\text{C}$

⇒ Compounds: Ethylene gas, Ethrel, Florel

⇒ Can stimulate adventitious root formation; may be an indirect effect; rooting generally occurs with intact plants, not cuttings.

⇒ Wounding and auxin can trigger ethylene production

# Abscissic Acid (ABA)

- ⇒ Compound: ABA
- ⇒ Acts antagonistically with gibberellic acid (GA); both share the same chemical pathway (Mevalonic Acid pathway)
- ⇒ Inhibitor; occurs during drought stress.
- ⇒ Generally not used in propagation; can increase adventitious bud formation in leaf cuttings
- ⇒ Inhibitors used in Hare's Rooting powder — “cocktail” with auxin & other compounds.

# Ancillary Compounds

- ⇒ **Compounds: Some are Growth Retardants/Inhibitors**
- ⇒ **Alar (B-9), CCC, Arest, Sumagic -- antagonistic with GA**
- ⇒ **Polyamines**
- ⇒ **Phenolics -- “Rooting Cofactors”**  
**di-phenolics--inhibit IAA oxidase**

# New Potential Phytohormones

⇒ Spermidine (polyamine)



# IPPS



*Hartmann and Kester's*

## **PLANT PROPAGATION:**

*Principles and Practices*

Seventh Edition



Hudson T. Hartmann

Dale E. Kester

Fred T. Davies, Jr.

Robert L. Geneve

<http://aggie-horticulture.tamu.edu>



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# Aggie Horticulture



PLANTanswers

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